



**QUEEN'S
UNIVERSITY
BELFAST**

Attitude and confidence of undergraduate medical programme educators to practice and teach evidence-based healthcare: a cross-sectional survey

Young, T., Esterhuizen, T. M., Volmink, J., & Clarke, M. (2016). Attitude and confidence of undergraduate medical programme educators to practice and teach evidence-based healthcare: a cross-sectional survey. *International Journal of Evidence Based Healthcare*, 14(2), 74-83.
<https://doi.org/10.1097/XEB.0000000000000068>

Published in:
International Journal of Evidence Based Healthcare

Document Version:
Publisher's PDF, also known as Version of record

Queen's University Belfast - Research Portal:
[Link to publication record in Queen's University Belfast Research Portal](#)

Publisher rights

Copyright 2016 the authors.
This is an open access article published under a Creative Commons Attribution-NonCommercial-NoDerivs License (<https://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits distribution and reproduction for non-commercial purposes, provided the author and source are cited.

General rights

Copyright for the publications made accessible via the Queen's University Belfast Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The Research Portal is Queen's institutional repository that provides access to Queen's research output. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact openaccess@qub.ac.uk.

OPEN

Attitude and confidence of undergraduate medical programme educators to practice and teach evidence-based healthcare: a cross-sectional survey

Taryn Young,^{a,b} Tonya M. Esterhuizen,^a Jimmy Volmink^{a,b} and Mike Clarke^c

^aCentre for Evidence-based Healthcare, Faculty of Medicine and Health Sciences, Stellenbosch University, Cape Town, ^bCochrane South Africa, South African Medical Research Council, Tygerburg, South Africa, and ^cNorthern Ireland Network for Trials Methodology Research, Queen's University Belfast, Belfast, Northern Ireland

ABSTRACT

Aim: Medical student educators play critical roles in evidence-based healthcare (EBHC) teaching and learning and as role models practicing EBHC. This study assessed their confidence to practice and teach EBHC, their attitude to EBHC and barriers to practicing and teaching EBHC.

Methods: We conducted a cross-sectional online survey of educators of undergraduate medical students at a South African academic institution. STATA 12 was used for quantitative data analysis. Responses to open-ended questions were coded, and further interpretation done using thematic content analysis.

Results: Forty two (19%) educators from various departments responded to the invitation sent to everyone formally involved in teaching undergraduate medical students. They had high levels of knowledge and understanding of EBHC. Many had received training in teaching and learning approaches, although EBHC training received was mainly on enabling competencies. Limitations to practicing EBHC included lack of time, clinical workload, limited access to Internet and resources, knowledge and skills. One quarter of the respondents indicated that they teach EBHC. Perceived barriers to teaching EBHC reported related to students (e.g. lack of interest), context (e.g. access to databases) and educators (e.g. competing priorities). Respondents' suggestions for support included reliable Internet access, easy point-of-care access to databases and resources, increasing awareness of EBHC, building capacity to practice and facilitate learning of EBHC and a supportive community of practice.

Conclusion: Educators play a critical role in facilitating EBHC learning not just in the classroom, but also in practice. Without adequate support, training and development, they are ill equipped to be the role models future healthcare professionals need.

Key words: confidence, educators, evidence-based healthcare, practice, teaching

Int J Evid Based Healthc 2016; 14:74–83.

Background

Using best evidence to inform healthcare decisions is widely recognized as a key competency for

all healthcare professionals.¹ Academic institutions are implementing evidence-based healthcare (EBHC) as part of learning in the curriculum of healthcare professionals. These curricula usually cover critical enquiry and formulating clear questions when faced with a scenario of uncertainty, finding best research evidence applicable to the problem, critically appraising the evidence for validity, clinical relevance and applicability, interpreting and applying the findings in the clinical setting and evaluating the performance. Specific EBHC competencies and assessment approaches link to each of these steps.^{1,2}

Clinically integrated teaching and learning, with a focus on learning linked to real-world problems in the

Correspondence: Dr Taryn Young, MD, Centre for Evidence-based Health Care, Faculty of Medicine and Health Sciences, Stellenbosch University, Cape Town, South Africa.

E-mail: tyoung@sun.ac.za

This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 License, where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially.

DOI: 10.1097/XEB.0000000000000068

clinical setting and learning by doing, as modelled by Sackett³ are considered to be the more effective approaches for improving EBHC knowledge, skills and attitudes.⁴ Successful teaching and learning depends on factors related to the learner, the educator/lecturer, and on having a supportive environment with teaching and learning opportunities. Educators play a critical role in the delivery and facilitation of EBHC teaching and learning, in encouraging critical enquiry, in fostering reflective practices and in being role models for the practice of EBHC in the clinical setting.⁵

Within the clinical setting, clinician lecturers/educators who have received EBHC training are more likely to teach the application of EBHC.⁶ A study in New Zealand among clinical teachers found that those who received training in EBHC are more likely to teach its application in the clinical setting and are more comfortable to engage students on topics and issues related to EBHC,⁷ and this was more often seen among general practitioners than specialists. Among nurse educators, Melnyk *et al.*⁸ found significant relationships between educators' knowledge of EBHC and their beliefs about the value of EBHC, the ability to practice EBHC and the relationship between teaching EBHC and advancing the profession and their comfort in teaching EBHC. The CREATE framework,² which provides an international consensus statement on EBHC assessment tools, defines self-efficacy as the individual's judgments regarding their ability to perform a certain activity and notes that educators' confidence in their ability may increase their likelihood to engage in practicing the various EBHC steps. Internationally, training initiatives thus focus on training trainers in EBHC to enhance their capacity to integrate EBHC teaching and learning in the clinical setting.⁹ Also on the increase are initiatives to build confidence in teaching and learning principles and theories.¹⁰

In South Africa, the Colleges of Medicine of South Africa includes critical appraisal skills in curricula for medical specialist training while the Medical and Dental Professions Board of the Health Professions Council of South Africa states in its regulations for Registration of Students, Undergraduate Curricula and Professional Examinations in Medicine and Dentistry that:

The emphasis in teaching should be on fundamental principles and methods that promote understanding and problem-solving skills and not only on the purely factual knowledge which, in any event, becomes outdated. ... They should be taught at all times to be critical of old and new knowledge and to evaluate data, statistics, thinking and methods objectively.

The Health Professions Council of South Africa used the CanMEDS framework¹¹ to define the desired graduate attributes of a newly qualified healthcare professional. This now serves as a guide to the essential abilities of a newly qualified health professional to optimize patient outcomes and defines the attributes of the graduate according to seven interdependent roles: Medical Expert, Scholar (which includes EBHC), Professional, Communicator, Collaborator, Manager and Health Advocate.

At Stellenbosch University an ongoing project aims to develop and implement undergraduate EBHC teaching and learning to medical undergraduates in an integrated manner. To inform curriculum development, an assessment of the medical curriculum was conducted, including a document review of the 2011 curriculum, a survey of recent graduates¹² and interviews with faculty. This found that EBHC is covered to varying degrees with teaching in specific modules, which it was not explicitly integrated in a stepwise fashion and did not progress from foundational knowledge to the acquisition of skills and practical competencies throughout the curriculum. Recent graduates felt that they lacked EBHC skills and proposed that EBHC teaching and learning be integrated into clinical rotations, making use of relevant examples in different disciplines.

As educators play a key role in facilitating the teaching and learning of EBHC, especially within the clinical setting, the study reported here assessed educators' confidence in practicing, and their attitude, to EBHC, as well as their confidence in teaching EBHC and the barriers they had experienced, or perceived, to practicing and teaching EBHC.

Methods

A cross-sectional survey was conducted in 2014. The study population included all faculty members involved in teaching on the undergraduate medical curriculum across the 10 departments at the Stellenbosch University Faculty of Medicine and Health Sciences. All those employed by the university, and those on joint appointments, whose role included teaching of undergraduate medical students were invited to participate by e-mail, and provided with a link to the online questionnaire. A reminder was sent after 2 weeks.

The structured questionnaire sought information regarding demographics and training received, experience in teaching and learning, and previous exposure to EBHC (training received, research conducted, etc.). We used validated tools for assessing confidence in practicing, and attitude to, EBHC.² Confidence in practicing EBHC was assessed using the Evidence-based

Practice Confidence¹³ scale and questions were included to assess attitude.¹⁴ Visual analogue scales measured attitudes to, and confidence in, teaching EBHC⁷ and open-ended questions explored barriers to practicing and teaching EBHC. The questionnaire was available in English and Afrikaans. It was first developed in English and then translated to Afrikaans. The Afrikaans version was back translated by a person independent of the research team, and the original English and the back-translated version compared to ensure that the meaning of the questions was not lost.

STATA 12 (StataCorp LP, College Station, Texas, USA) was used for quantitative data analysis. Data were first checked for completeness. Continuous variables were summarized using descriptive summary measures and related measures of dispersion. Categorical data were summarized using proportions. For questions on knowledge we assessed consistency and found high Cronbach's alphas (95%) and therefore combined all 16 items into one knowledge score. The highest score was allocated to the best level of knowledge, giving a knowledge score with a maximum 80. For questions on attitude to practicing EBHC we reversed the scores of the negatively phrased items, for example 'I rarely formulate questions about patients' and then added all the items together to get an overall score between 10 and 50 (Cronbach's alpha 57%). For confidence in practicing EBHC¹⁴ we grouped the scores into five categories aligned with the five steps in practicing EBHC namely ask clear questions, search for research evidence, appraise and interpret the evidence, apply the evidence and audit practices. Scores for self-perceived confidence in teaching EBHC were also combined into an overall score (maximum 55). Bivariate analysis of associations between factors such as demographics, education and exposure to EBHC, and outcomes such as attitude and confidence to practice and teach EBHC were assessed using correlation analysis, analysis of variance testing, Pearson's χ^2 analysis and *t* tests as appropriate. Responses to open-ended questions on barriers, and proposed strategies to overcome these, to practicing and teaching EBHC were coded and analysis and interpretation were done by the investigators, using thematic content analysis to identify key emerging themes. We linked these to the conceptual framework for integrated teaching and learning of EBHC, developed following semistructured interviews with 24 EBHC programme coordinators from around the world, which revolves around the engagement between the learner and the educator within the institutional context.¹⁵

Participants were asked to provide informed consent for participation in the online survey. Participation was

voluntary. The study proposal was approved by the Stellenbosch University Health Research Ethics Committee (S12/10/262(C)). To enhance response rate, we had a lottery for respondents, with a sponsored conference registration, for a conference of their choice, to the value of R5000 as the prize. Participants who wanted to enter the lottery had to provide their cell phone numbers, which were only be used to notify the winner. Thirty-six respondents entered the lucky draw.

Results

Forty two (19%) of 227 faculty members involved in teaching undergraduate medical students responded. They worked across various departments, were mainly senior lecturers and offered teaching to all years of medical students (Table 1). About 75% had attended training on research methodology (mainly epidemiology, research proposal writing, biostatistics, systematic reviews and qualitative research methods), and to a lesser extent training on knowledge translation and change management. Most participants had conducted primary research, with only a few conducting systematic reviews. More than half (57%) indicated that they had done some training in EBHC in the past 5 years by attending short courses, workshops/seminars, online courses, journal clubs or by reading articles on EBHC. These activities mainly addressed enabling competencies such as epidemiology, biostatistics, research methodology and the basic principles of EBHC. Most (85%) had attended teaching and learning training events that had content such as teaching and learning strategies, assessment, curriculum planning, teaching EBHC, supervision and promoting active learning. Participants described EBHC as:

Supporting clinical decision-making by combining best available evidence with own experience, patient preference and local factors' and 'Healthcare practices (of any nature – e.g. prevention, diagnosis, treatment, prognosis etc.) that are informed by evidence as far as possible; and recognising where there is inadequate/insufficient evidence to inform these practices. It implies ongoing changes to healthcare practice when new evidence becomes available.

Some emphasised use of research evidence and did not include reference to combining this with clinical experience and patient preferences. Participants' self-reported understanding of EBHC-related terms is described in Table 2. Using the overall knowledge score

Table 1. Profile of survey responders

Total survey population	227	
Overall response rate	42 (19%)	
Age	Mean 45.4 years (SD 9.5)	
Sex (M/F)	21/21	
Highest qualification	<i>n</i>	%
MB,ChB	3	7
MSc	4	10
MMED/other specialist	18	43
PhD	8	19
Other	9	21
Response rate per department (N)		
Anaesthesiology and critical care (6)	0	0
Biomedical sciences (21)	4	19
Interdisciplinary health sciences (20)	7	35
Medical imaging and clinical oncology (4)	0	0
Medicine (55)	8	15
Obstetrics and gynaecology (11)	3	27
Paediatrics and child health (22)	5	23
Pathology (29)	9	31
Psychiatry (19)	1	5
Surgical sciences (31)	3	10
Centres (9)	2	22
Current position		
Lecturer	9	21
Senior lecturer	16	38
Professor	9	21
Registrar (specialist in training)	1	2
Other	7	17
Teaching medical students (year of study)		
MB,ChB 1	18	43
MB,ChB 2	23	55
MB,ChB 3	30	71
MB,ChB 4	27	64
MB,ChB 5	27	64
MB,ChB 6	23	55
How long working at University	8 years (median) (IQR 5–15)	

How long teaching UG medical students	9.5 years (median) (IQR 6–18)
Training in EBHC	24 (57%)
Training in research methodology	31 (74%)
Research experience	
Led the conduct of a primary research project	36 (86%)
Contributed to the conduct of a primary research project	39 (93%)
Led conduct of a systematic review	4 (10%)
Contributed to conduct of a systematic review	8 (19%)
Training in teaching and learning	35 (85%)

EBHC, evidence-based healthcare; IQR, interquartile range.

for the 16 items, maximum score 80, the median score was 72 (interquartile range 62–77). The knowledge scores were not significantly associated with training, highest qualification, years since qualifying, position, academic department or age.

Attitude to evidence-based healthcare

Figure 1 graphically depicts responses to the questions on attitude to practicing EBHC. The items were framed both positively, for example 'EBHC is useful on a daily basis' and negatively, for example 'I rarely formulate questions about patients'. Most felt that EBHC is a

realistic option in their practice and that lifelong learning is important. However, more than 50% felt that literature searches are too time-consuming to undertake in the clinic and that questions can be answered faster by referring to a textbook or a consultant. The overall mean score was 38 (SD 5) (maximum score 50). Data were normally distributed, so we compared the independent variables to attitude score using *t* tests and analysis of variance. Training in EBHC and research methods, qualification, time since qualification, faculty position, age, conducting systematic reviews and years of teaching were not significantly associated with attitude.

Table 2. Self-reported understanding of evidence-based healthcare-related terms often used in research articles

	Yes, understand and I could explain to others		Some understanding		Do not understand, but would like to understand		Do not understand, it would not be helpful to me to understand		No idea about this	
	n	%	n	%	n	%	n	%	n	%
Absolute risk difference	12	29	5	12	10	24	7	17	8	19
Allocation concealment	18	43	3	7	7	17	7	17	7	17
Case control study	31	74	6	14	4	10	0	0	1	2
Case series	28	67	7	17	4	10	2	5	1	2
Cohort study	32	76	6	14	3	7	0	0	1	2
Confidence interval	26	62	7	17	7	17	1	2	1	2
Selection bias	29	69	7	17	3	7	0	0	3	7
Intention to treat analysis	17	41	8	19	9	21	4	10	4	10
Lost to follow-up	28	67	7	17	5	12	0	0	2	5
N.N.T. (number needed to treat)	20	48	6	14	6	14	9	21	1	2
Sample size	31	74	4	10	6	14	0	0	1	2
Systematic review	25	60	8	19	6	14	2	5	1	2
Meta-analysis	23	55	9	21	8	19	1	2	1	2
Odds ratio	17	41	13	31	6	14	4	10	2	5
Confounding	22	52	10	24	7	17	1	2	2	5
Sensitivity	30	71	7	17	4	10	0	0	1	2

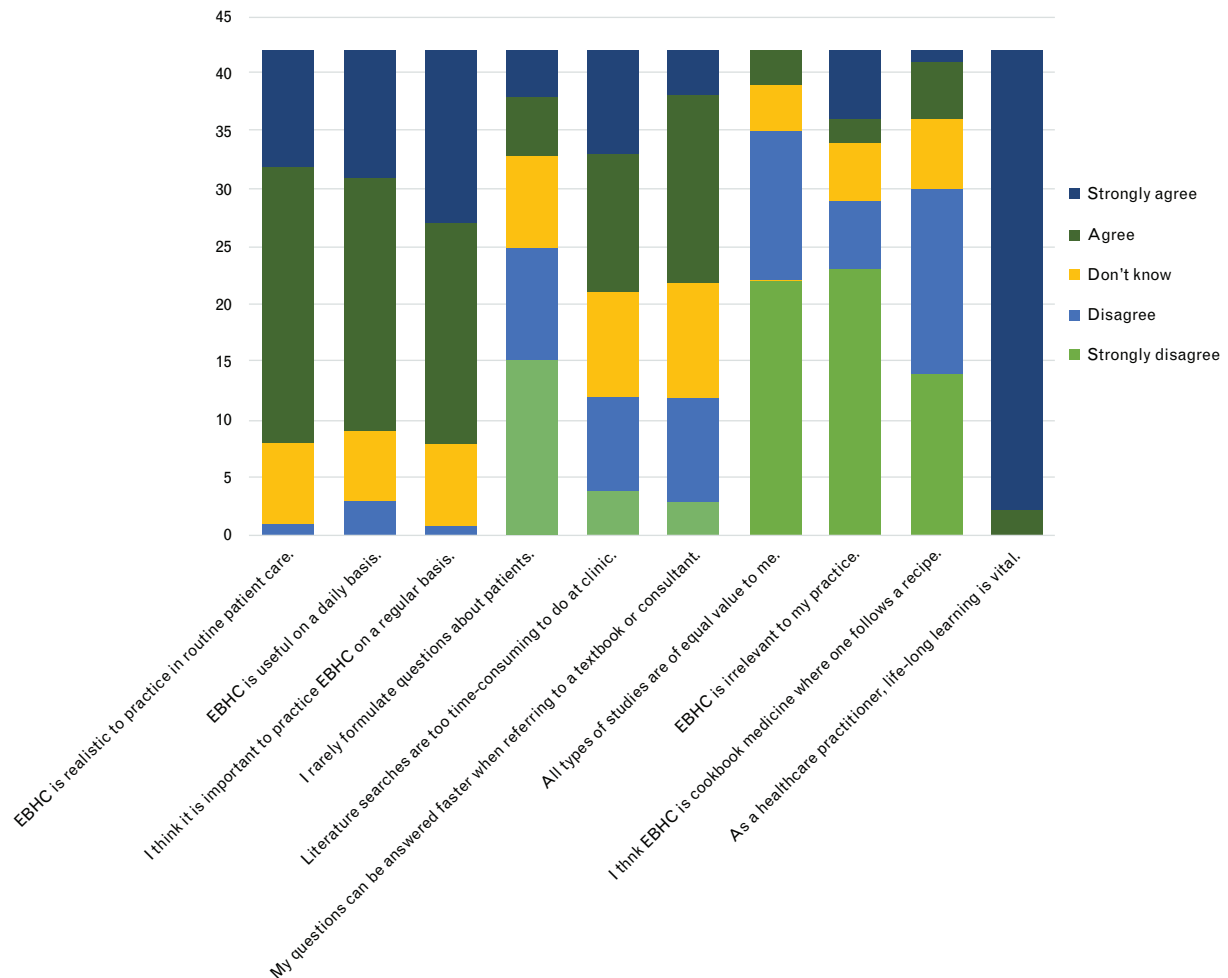


Figure 1. Educators' attitudes to evidence-based healthcare (EBHC)¹⁴.

Practicing evidence-based healthcare

Lecturers' confidence in practicing EBHC is summarized in Table 3, highlighting levels of confidence that are high overall but with lower levels for interpreting statistics. They raised various barriers, relating to the individual or the context, to practicing EBHC. By far the most common were lack of time, clinical workload, limited access to Internet and resources, knowledge and skills.

No simple solution to increase time - clinicians' responsibilities in the hospital, including patient and student load will only be addressed if more posts are made available.

They made suggestions on how this could be addressed, calling for more staff and dedicated time for research and for faculty development. They proposed capacity development opportunities to especially

enhance their capacity to interpret and understand biostatistics, searching skills, how to read papers and on time management. They also suggested a 'support group' to assist each other. To create an enabling environment, they suggested widely available and reliable Internet access and WIFI, access to relevant literature and having evidence informed clinical guidelines available at the point of care. Furthermore, they suggested using auditing and feedback to enhance practices.

Teaching evidence-based healthcare

Ten participants (24% of respondents) indicated that they teach EBHC. This was done through lectures, small group tutorials, teaching at the bedside, online learning and including EBHC concepts in assessments. The content covered in these sessions focused on the enabling competencies (epidemiology, biostatistics),

Table 3. Educators' self-perceived confidence in practicing evidence-based healthcare (n = 42)¹⁴

Confidence in current ability to	0% No confidence	10%	20%	30%	40%	50%	60%	70%	80%	90%	100% completely confident
identify a gap in your knowledge related to a patient or client situation (e.g. history, assessment, treatment)?	1	3		1	1	1	2	5	10	9	9
formulate a question to guide a literature search based on a gap in your knowledge?				3		1	4	9	7	8	10
effectively conduct an online literature search to address the question?			1	0	1	1	1	10	7	11	10
critically appraise the strengths and weaknesses of study methods (e.g. appropriateness of study design, recruitment, data collection and analysis)?			1	2	3	5	5	8	8	8	2
critically appraise the measurement properties (e.g. reliability and validity, sensitivity and specificity) of standardized tests or assessment tools you are considering using in your practice?			1	2	2	8	8	7	6	5	3
interpret study results obtained using statistical tests such as t-tests or chi-square tests?	1	4	3	1	5	3	6	4	8	4	3
interpret study results obtained using statistical procedures such as linear or logistic regression?	1	5	4	2	6	0	6	9	4	4	1
determine whether evidence from the research literature applies to your patient's or client's situation?	2		1	1	1	3	4	10	6	9	5
ask your patient or client about his/her needs, values and treatment preferences?	2			1	3	2	1	5	9	9	10
decide on an appropriate course of action based on integrating the research evidence, clinical judgment and patient or client preferences?	2			1	2	4	1	6	11	9	6
continually evaluate the effect of your course of action on your patient's or client's outcomes?	2			2	1	4	2	9	6	11	5

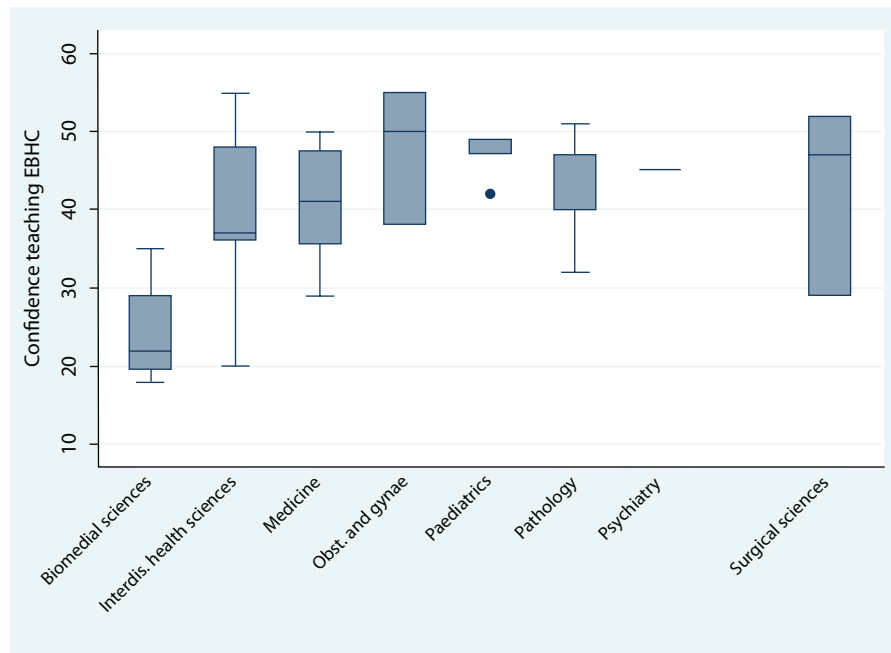


Figure 2. Confidence in teaching evidence-based healthcare (EBHC) per department*. *Using total score (maximum = 55).

basic EBHC principles and searching skills. The overall mean score for self-perceived confidence in teaching EBHC was 40 (SD 11) of a maximum of 55 ($n = 42$).

Most (38) of the 42 respondents indicated that they were confident to help medical students find relevant articles in MEDLINE (or other bibliographic databases), and to guide critical review of articles (60% or higher on the visual analogue scale). Fewer (30) indicated that they were confident to assist students phrase a clear question following a clinical encounter with a patient, and to guide students in considering the application of the results of their critique of articles to the patient's care. Twenty seven selected 60% or higher on the visual analogue scale for confidence in evaluating students' EBHC knowledge. Total scores for the respondents from each department are shown in Fig. 2.

Educators raised a number of perceived barriers to teaching EBHC, which relate to the students, the context and the educators. They felt that the curriculum is full, that students are subjected to information overload, that there is no scaffolding of EBHC learning over the course of the degree and that EBHC is not integrated in practice. Lack of Internet access, especially at point-of-care, was commonly listed. With respect to students the size of student groups, immaturity and lack of interest of students were seen as barriers to EBHC learning while competing priorities and lack of

time ('am involved with too many other activities'), as well as limited EBHC knowledge and skills ('I need to upgrade and maintain my knowledge of EBHC') and the tendency to stick to habits influence how educators facilitate EBHC learning.

Suggestions for addressing these challenges included improving departmental Internet access, exploring WIFI access for the whole faculty, and easy point-of-care access to databases and resources. Respondents stressed the importance of increasing awareness of the value and utility of EBHC ('demonstrate to them the value of EBHC') and thus the need for EBHC teaching. They also emphasized building capacity to both practice and facilitate learning of EBHC, and expressed the need for more time to devote to teaching students ('Get somebody to take over my postgraduate activities. Less meetings'). Furthermore, they called for promotion of critical thinking among students, incorporating the teaching and learning of EBHC from the start of the curriculum, and making 'EBHC applicable and relevant to students'. Respondents felt that there needs to be dedicated time to apply EBHC principles especially within the clinical setting, and that it should be integrated in assessments. To support each other, educators requested help from others who are particularly proficient, for example 'a working group supporting educators', and highlighted the need for evaluation

and ongoing refinement of teaching approaches and material.

Discussion

This is one of only a few studies conducted in South Africa to assess one or more of the following: undergraduate educators' confidence in practicing and teaching EBHC, attitudes to EBHC and to practicing and teaching EBHC. This study links to ongoing work at Stellenbosch University supporting the implementation of graduate attributes, specifically linked to developing and implementing clinically integrated EBHC teaching and learning for medical undergraduates, a process within which educators play a critical role.^{5,15} Despite respondents having a high self-reported level of knowledge and understanding of EBHC concepts attitudes towards EBHC varied (Fig. 1). Their confidence in both teaching and practicing EBHC were generally high. Those who were teaching EBHC focused the curricula content on enabling competencies of EBHC, basic EBHC principles and searching skills, rather than on reading, interpreting and considering the application of different types of articles. As educators are faced with various competing priorities the need was expressed for dedicated faculty development and a community of practice to provide support in the implementation of EBHC teaching and learning.

Similar studies among South African psychiatrists and general practitioners with a special interest in mental health,¹⁶ general practitioner and specialist educators in New Zealand⁷ and nurse educators in the United States⁸ found that those who had attended EBHC courses were more likely to teach EBHC. Barriers to teaching EBHC, resonating with our survey, were centred around lack of time, lack of support, lack of evidence in some clinical areas and the need for more training in teaching EBHC. Findings of this survey also resonate with a curriculum assessment,¹² which found that there is no scaffolding of EBHC learning over the course of the degree and that EBHC is not integrated in practice.

A supportive enabling institutional, and health sector, environment is important for advancing EBHC learning. Educators need to be confident and competent to facilitate the learning and, to this end, require opportunities to enhance their capacity in EBHC and in how to facilitate learning.^{10,15} Furthermore, through working together, building on each other's strengths, sharing best practices and lessons learnt, in a supportive community of practice can build the critical mass of educators needed to facilitate learning across the various disciplines.

Respondents worked across various departments. Our survey had limited the power to assess associations between confidence to practice and teach EBHC and variables such as attitude and training. The low response rate might also mean that those who took part are not representative of the target population. The nonresponders may have different levels of confidence to practice and teach EBHC, their attitude may vary and they could be experiencing different challenges. To assess this we conducted brief follow-up survey of nonresponders, to which 14 educators responded. They described EBHC in a similar way to responders and listed lack of time, length of the survey, limited involvement with undergraduate teaching and that EBHC is irrelevant to their practice as reasons for not participating.

Conclusion

Educators play a critical role in facilitating learning not just in the classroom, but also in practice. This survey, despite low response rate, shows that even for those with high levels of self-reported knowledge and understanding of EBHC; adequate support, training and development and an enabling environment are important for educators to be the role models future healthcare professionals need.

References

1. Dawes M, Summerskill W, Glasziou P, et al. Sicily statement on evidence-based practice. *BMC Med Educ* 2005; 5: 1.
2. Tilson JK, Kaplan SL, Harris JL, et al. Sicily statement on classification and development of evidence-based practice learning assessment tools. *BMC Med Educ* 2011; 11: 78.
3. Sackett DL, Straus SE. Finding and applying evidence during clinical rounds: the "evidence cart". *JAMA* 1998; 280: 1336–8.
4. Young T, Rohwer A, Volmink J, Clarke M. What are the effects of teaching Evidence-Based Healthcare (EBHC)? Overview of systematic reviews. *PLoS One* 2014; 9: e86706.
5. Sackett DL, Straus SE, Richardson WS, et al. Evidence-based medicine. How to practise and teach EBM. 2nd ed. Edinburgh: Churchill Livingstone; 2000.
6. Coppus SF, Emparanza JI, Hadley J, et al. A clinically integrated curriculum in evidence-based medicine for just-in-time learning through on-the-job training: the EU-EBM project. *BMC Med Educ* 2007; 7: 46.
7. Kljakovic M, Love T, Gilbert A. Attitudes of teachers to evidence based medicine. *Aust Fam Physician* 2004; 33: 376–8.
8. Melnyk BM, Fineout-Overholt E, Feinstein NF, et al. Nurse practitioner educators' perceived knowledge, beliefs, and teaching strategies regarding evidence-based practice: implications for accelerating the integration of evidence-based practice into graduate programs. *J Prof Nurs* 2008; 24: 7–13.

9. Thangaratinam S, Barnfield G, Weinbrenner S, *et al.* Teaching trainers to incorporate evidence-based medicine (EBM) teaching in clinical practice: the EU-EBM project. *BMC Med Educ* 2009; 9: 59.
10. Steinert Y, Mann K, Centeno A, *et al.* A systematic review of faculty development initiatives designed to improve teaching effectiveness in medical education: BEME Guide No. 8. *Med Teach* 2006; 28: 497–526.
11. Frank J. The CanMEDS 2005 physician competency framework. Better standards. Better physicians. Better care Ottawa: The Royal College of Physicians and Surgeons of Canada; 2005.
12. Rohwer A, Willems B, Young T. Taking stock of evidence-based healthcare in the undergraduate medical curriculum at Stellenbosch University: combining a review of curriculum documents and input from recent graduates. *Afr J Health Prof Educ* 2015; 7(1): 98–104; 2078-5127. <http://hmpg.co.za/index.php/ajhpe/article/view/7977>. [Accessed 15 June 2015].
13. Salbach NM, Jaglal SB. Creation and validation of the Evidence-Based Practice Confidence scale for healthcare professionals. *J Eval Clin Pract* 2011; 17: 794–800.
14. Baum KD. The impact of an evidence-based medicine workshop on residents' attitudes towards and self-reported ability in evidence-based practice. *Med Educ Online* 2003; 8: 4.
15. Young T, Rohwer A, van Schalkwyk S, *et al.* Persistence and pragmatism: experiences and lessons learnt from the implementation of clinically integrated teaching and learning of evidence-based healthcare – a qualitative study. *PLoS One* 2015; 10: e0131121.
16. Siegfried N, Swingler G, Seedat S, *et al.* What do South African psychiatrists and GPs think, feel and know about evidence-based mental healthcare? *S Afr Med J* 2003; 93: 114–7.